CLAIMS

What is claimed is:

1. A composite particle, comprising:
an absorbent material formed into a particle; and
at least one performance-enhancing active added to the absorbent material.

2. A composite particle as recited in claim 1, wherein the absorbent material is a liquid-absorbing material and is selected from a group consisting of: a mineral, fly ash, absorbing pelletized material, perlite, silica, organic materials, and mixtures thereof.

3. A composite particle as recited in claim 2, wherein the absorbent material is a mineral selected from a group consisting of: bentonite, zeolite, montmorillonite, diatomaceous earth, opaline silica, Georgia White clay, sepiolite, calcite, dolomite, slate, pumice, tobermite, marls, attapulgite, kaolinite, halloysite, smectite, vermiculite, hectorite, Fuller's earth, fossilized plant materials, expanded perlite, gypsum, and mixtures thereof.

4. A composite particle as recited in claim 1, wherein the absorbent material comprises sodium bentonite granules having a mean particle diameter of about 5000 microns or less.

5. A composite particle as recited in claim 4, wherein the absorbent material comprises sodium bentonite granules having a mean particle diameter of about 3000 microns or less.

6. A composite particle as recited in claim 4, wherein the absorbent material comprises sodium bentonite granules having a mean particle diameter in the range ofabout 25 to about 150 microns.

7. A composite particle as recited in claim 1, wherein the added performance-enhancing active includes at least one of an antimicrobial, an odor reducing material, a binder, a fragrance, a health indicating material, a color altering agent, a dust reducing agent, a nonstick release agent, a superabsorbent material, cyclodextrin, zeolite, activated carbon, a pH altering agent, a salt forming material, a ricinoleate and mixtures thereof.

8. A composite particle as recited in claim 1, wherein a performance-enhancing additive is sprayed onto the particles.

9. A composite particle as recited in claim 1, wherein granules of a performance-enhancing additive are dry-blended with the particles.

10. A composite particle as recited in claim 1, wherein the performance-enhancing active comprises a boron-containing compound.

11. A composite particle as recited in claim 10, wherein the boron containing compound is present in an antimicrobially effective amount, wherein the boron containing compound is selected from a group consisting of borax pentahydrate, borax decahydrate, boric acid, polyborate, tetraboric acid, sodium metaborate, anhydrous, boron components of polymers, and mixtures thereof.

12. A composite particle as recited in claim 1, wherein the performance-enhancing active inhibits the formation of odor, the active comprising a water soluble metal salt selected from a group consisting of: silver, copper, zinc, iron, and aluminum salts and mixtures thereof.

13. A composite particle as recited in claim 1, wherein the performance-enhancing active is present in an effective amount.

14. A composite particle as recited in claim 1, wherein the performance-enhancing active is activated carbon.

15. A composite particle as recited in claim 14, wherein the activated carbon is present in about 5 weight percent or less based on a weight of the composite particle.

16. A composite particle as recited in claim 14, wherein the activated carbon is present in about 1 weight percent or less based on a weight of the composite particle.

17. A composite particle as recited in claim 14, wherein the activated carbon has a mean particle diameter of about 5000 microns or less.

18. A composite particle as recited in claim 14, wherein the activated carbon has a mean particle diameter of about 1500 microns or less.

19. A composite particle as recited in claim 14, wherein the activated carbon has a mean particle diameter of about 50 microns or less.

20. A composite particle as recited in claim 1, wherein the at least one performance-enhancing active is substantially homogeneously dispersed throughout at least a portion of the absorbent material.

21. A composite particle as recited in claim 1, wherein the at least one performance-enhancing active is physically dispersed in at least one layer.

22. A composite particle as recited in claim 1, wherein the performance-enhancing active is physically dispersed in pockets in the particle.

23. A composite particle as recited in claim 1, wherein the performance-enhancing active is physically dispersed in at least one position selected from along surfaces of the particle and contained within pores of the particle.

24. A composite particle as recited in claim 1, further comprising an absorbent core, the absorbent material being coupled to the core.

25. A composite particle as recited in claim 1, further comprising a non-absorbent core, the absorbent material being coupled to the core.

26. A composite particle as recited in claim 1, further comprising a hollow core, the absorbent material being coupled to the core.

27. A composite particle as recited in claim 1, further comprising a core, the absorbent material at least partially surrounding the core in the form of a shell, wherein an average thickness of the shell is at least about four times an average diameter of the core.

28. A composite particle as recited in claim 1, further comprising a core, the absorbent material at least partially surrounding the core in the form of a shell, wherein an average thickness of the shell is between about 1 and about 4 times an average diameter of the core.

29. A composite particle as recited in claim 1, further comprising a core, the absorbent material at least partially surrounding the core in the form of a shell, wherein an average thickness of the shell is less than an average diameter of the core.

30. A composite particle as recited in claim 1, further comprising a core, the absorbent material at least partially surrounding the core in the form of a shell, wherein an average thickness of the shell is less than about one-half an average diameter of the core.

31. A composite particle as recited in claim 1, further comprising a heavy core comprised of a material having a density higher than a density of the absorbent material, the absorbent material being coupled to the core.

32. A composite particle as recited in claim 1, further comprising a lightweight core comprised of a material having a density lower than a density of the absorbent material, the absorbent material being coupled to the core.

33. A composite particle as recited in claim 1, further comprising a core comprised of a pH-altering material, the absorbent material being coupled to the core.

34. A composite particle as recited in claim 1, wherein the particle has a bulk density of less than about 90% of a bulk density of a generally solid particle containing the absorbent material alone.

35. A composite particle as recited in claim 1, wherein the particle has a bulk density of less than about 70% of a bulk density of a generally solid particle containing the absorbent material alone.

36. A composite particle as recited in claim 1, wherein the particle has a bulk density of less than about 50% of a bulk density of a generally solid particle containing the absorbent material alone.

37. A composite particle as recited in claim 1, further comprising multiple cores, the absorbent material being coupled to the cores.

38. A composite particle as recited in claim 1, wherein the composite particle has a hydraulic conductivity value of about 0.25 cm/s or less.

39. A composite particle as recited in claim 1, wherein the composite particle exhibits reduced sticking to a container in which the composite particle rests when the particle is wetted relative to a generally solid particle under substantially similar conditions.

40. A composite particle as recited in claim 1, wherein the composite particle has a moisture content of less than about 25% by weight based on a weight of the composite particle.

41. A composite particle as recited in claim 1, wherein the composite particle has a moisture content of less than about 15% by weight based on a weight of the composite particle.

42. A composite particle as recited in claim 1, wherein the composite particle has a moisture content of less than about 10% by weight based on a weight of the composite particle.

43. A composite particle as recited in claim 1, wherein the composite particle is capable of absorbing a weight of water equaling at least about 90 percent of a weight of the composite particle.

44. A composite particle as recited in claim 1, wherein the composite particle is capable of absorbing a weight of water equaling at least about 75 percent of a weight of the composite particle.

45. A composite particle as recited in claim 1, wherein the composite particle is capable of absorbing a weight of water equaling at least about 50 percent of a weight of the composite particle.

46. A composite particle as recited in claim 1, wherein the composite particle has a dusting attrition value of at most about 15% as measured by ASTM method E-728 Standard Test Method for Resistance to Attrition of Granular Carriers and Granular Pesticides.

47. A composite particle as recited in claim 1, wherein the composite particle has a malodor rating below about 15 as determined by a Malodor Sensory Method.

48. A composite particle as recited in claim 1, wherein the composite particle exhibits noticeably less odor after four days from contamination with animal waste as compared to a generally solid particle of the absorbent material alone under substantially similar conditions.

49. A composite particle as recited in claim 1, wherein the composite particle has been formed by an agglomeration process.

50. A composite particle as recited in claim49, wherein the agglomeration process is a pan agglomeration process.

51. A composite particle as recited in claim49, wherein the agglomeration process is at least one of a high shear agglomeration process, a low shear agglomeration process, a high pressure agglomeration process, a low pressure agglomeration process, a rotary drum agglomeration process, a fluid bed agglomeration process, a mix muller process, a roll press compaction process, a pin mixer process, a

batch tumble blending mixer process, an extrusion process and a fluid bed process.

52. A composite particle as recited in claim 1, wherein the composite particle has a bulk density of about 1.5 grams per cubic centimeter or less.

53. A composite particle as recited in claim 1, wherein the composite particle has a bulk density of 0.85 grams per cubic centimeter or less

54. A composite particle as recited in claim 53, wherein the composite particle has a bulk density of between about 0.25 and 0.85 grams per cubic centimeter .

55. A composite particle as recited in claim 1, wherein the particle has a liquid absorbing capability of from about 0.6 to about 2.5 liters of water per kilogram of particles.

56. A composite particle as recited in claim 1, wherein the particle is used in at least one of an animal litter product, a laundry product, a home care product, a water filtration product, an air filtration product, a fertilizer product, an iron ore pelletizing product, a pharmaceutical product, an agricultural product, a waste and landfill remediation product, a bioremediation product, and an insecticide product.

57. Multiple composite particles as recited in claim 1, wherein substantially each particle includes the active.

58. Multiple composite particles as recited in claim 1, wherein substantially each particle includes multiple actives.

59. Multiple composite particles as recited in claim 1, wherein some of the particles include a first active, and other particles contain a second active, the second active being different than the first active.

60. Multiple composite particles as recited in claim 1, wherein at least about 80% of the particles are retained in a clump upon addition of an aqueous solution.

61. Multiple composite particles as recited in claim 1, wherein at least about 90% of the particles are retained in a clump upon addition of an aqueous solution.

62. Multiple composite particles as recited in claim 1, wherein at least about 95% of the particles are retained in a clump after 6 hours upon addition of 10 ml of cat urine.

63. Composite particles having improved clumping characteristics, comprising:

granules of an absorbent material formed into particles, each particle having areas of more-water-soluble absorbent material and less-water-soluble absorbent material relative to each other, the areas of more-water-soluble absorbent material being capable of dislodging from the associated particle when wetted and becoming entrained between adjacent particles, the entrained absorbent material forming a bond between the adjacent particles.

64. Composite particles as recited in claim 63, wherein the absorbent material is sodium bentonite having a mean particle diameter of about 1000 microns or less.

65. Composite particles as recited in claim 64, wherein the sodium bentonite has a mean particle diameter in the range of about 25 to about 150 microns.

66. Composite particles as recited in claim 63, further comprising a performance-enhancing active, wherein the performance-enhancing active includes at least one of an antimicrobial, an odor reducing material, a binder, a fragrance, a health indicating material, a color altering agent, a dust reducing agent, a nonstick release agent, a superabsorbent material, cyclodextrin, zeolite, activated carbon, a pH altering agent, a salt forming material, a ricinoleate and mixtures thereof.

67. Composite particles as recited in claim 63, wherein a performance-enhancing additive is sprayed onto the particles.

68. Composite particles as recited in claim 63, wherein granules of a performance-enhancing additive is dry-blended with the particles, with or without addition of a binder.

69. Composite particles having improved odor reducing characteristics, comprising:
granules of an absorbent material; and
granules of an odor reducing active added to the absorbent material;
wherein pores are formed between the granules of the absorbent material such that at least some of the granules of the odor reducing active positioned towards a center of the particle are in fluid or gaseous communication with an outer atmosphere surrounding the particle.

70. A composite particle as recited in claim 69, wherein the odor reducing active is activated carbon.

71. A composite particle as recited in claim 70, wherein the activated carbon is present in about 5 weight percent or less based on a weight of the composite particle.

72. A composite particle as recited in claim 70, wherein the activated carbon is present in about 1 weight percent or less based on a weight of the composite particle.

73. A composite particle as recited in claim 70, wherein the activated carbon has a mean particle diameter of about 500 microns or less.

74 A composite particle as recited in claim 70, wherein the activated carbon has a mean particle diameter in the range of about 25 to 150 microns.

75. A composite particle as recited in claim 69, wherein the odor reducing active comprising a water soluble metal salt selected from a group consisting of: silver, copper, zinc, iron, and aluminum salts and mixtures thereof.

76. A method for forming composite particles, comprising:

adding granules of an absorbent mineral to an agglomerator, the granules of absorbent material having a particle size smaller than about 1000 microns;

adding granules of a performance-enhancing active to the agglomerator;

adding water to the agglomerator; and

agglomerating the mixture for forming particles of absorbent material and performance-enhancing active.

77. A method as recited in claim 76, further comprising adding granules of a core material to the agglomerator, the absorbent material and at least one performance-enhancing active surrounding the granules of the core material.

78. A method as recited in claim 76, wherein the performance-enhancing active includes at least one of an antimicrobial, an odor reducing material, a binder, a fragrance, a health indicating material, a color altering agent, a dust reducing agent, a nonstick release agent, a superabsorbent material, cyclodextrin, zeolite, activated carbon, a pH altering agent, a salt forming material, a ricinoleate and mixtures thereof.

79. A method as recited in claim 76, further comprising drying the particles to a desired state, wherein the particles have a bulk density of from about 0.15 to about 1.5 grams per cubic centimeter and a liquid absorbing capability of from about 0.6 to about 2.5 liters of water per kilogram of particles.

80. An animal litter, comprising:

an absorbent material formed into a particle;

activated carbon added to the absorbent material; and

optionally at least one other performance-enhancing active added to the absorbent material.

81. The animal litter as recited in claim 80, wherein the activated carbon is present in about 1 weight percent or less based on a weight of the animal litter.

82. A method for preparing a litter box for use by animals, comprising:

selecting a receptacle with a closed bottom, a plurality of interconnected generally upright side walls forming an open top and defining an inside surface; and

adding a litter material of absorbent composite particle form to the box.

83. A method as recited in claim 82, wherein the litter material further includes a performance-enhancing active mixed with the particles.